

REMARKS

This is intended as a full and complete response to the Final Office Action dated May 12, 2004, having a shortened statutory period for response set to expire on August 12, 2004. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-9 and 24-26 remain pending in the application.

Claim Rejections - 35 USC § 101

Claims 1-9 and 24-26 stand rejected under 35 U.S.C. 101 because the disclosed invention is inoperative and therefore lacks utility. In the rejection, the Examiner stated:

"The claims require the threads to be "fully cold formed" in combination with certain hardness specifically of about 27-32 HRC which, would not be possible according to the prior art incorporated by reference (Hermanson, US 5,334,268). Indeed, Hermanson describes the hardness as greater than 23 HRC (column 3, line 22), which is even less than that required by the instant invention, and concludes that "owing to the hardness" a different procedure is required wherein the threads are first cut prior to cold working (column 3, last paragraph). Therefore, in view of Hermanson's disclosure, the instant invention would be inoperative because when the hardness is between 27 and 32 HRC, the threads could not be fully cold formed."

Applicants respectfully traverse the rejection. In response to Applicants' Remarks made in the Response to Office Action dated November 10, 2003, the Examiner invited Applicants to provide evidence that the teaching of *Hermanson* (U.S. Pat. No. 5,334,268) is misleading or inaccurate. In response to this invitation, Applicant directs the Examiner's attention to *Rallis* (U.S. Pat. No. 6,413,326) which discusses *Hermanson* as follows:

"A series of patents to Hermanson et al., including U.S. Pat. Nos. 5,334,268, 5,405,457, and 5,405,461, (hereafter "Hermanson et al.") teach a method of making a high strength coupling wherein the coupling is heat treated to a hardness between 32 and 36 HRC. In this step, the coupling is heated and quenched in a salt bath maintained at a temperature below the martensite start (MS) temperature. This heat treatment, commonly called "Martempering" or "Marquenching", results in transformation of the steel microstructure to essentially martensite, a hard, brittle, body-centered tetragonal structure. The coupling threads are partially completed by machine cutting and subsequently finished by roll-threading." (col. 2, lines 16-28.)

...
In sucker rod couplings, this is usually accomplished by roll-forming the threads. This process, however, is limited to the softer grades of steel because costs of roll-forming greatly increase with harder materials. This is due to at least two factors: more power is required to turn the forming tool with harder grades of steel, and use of harder grades of steel results in decreased tool life, thereby requiring an increase in the number of tools necessary for manufacturing. If the coupling is heat treated to a high degree of hardness, the process becomes uneconomical. *This is why Hermanson et al. provides for partially machine cutting the threads, and finishing only the last few thousandths of an inch by roll-forming.* (col. 5, lines 4-16 (emphasis added).)

Applicants believe the quoted portion lends support to Applicants' position that the claimed invention is operative. While Applicants disagree with these statements to the extent that they suggest that the current invention is not commercially viable, Applicants agree with these statements to the extent that they provide that the current invention is physically possible.

Further, Applicants directs the Examiner's attention to the website: www.osg-sossner.com/catalogtap.asp?TapType=Forming. This address is part of a website for OSG, a manufacturer for metalworking tools. OSG advertises taps for cold forming threads up to a hardness of 35 HRC. This translates to a material strength of about 155,000 psi. Specifically, the website advertises that these are suitable for cold forming threads in hardened steel with a hardness up to 35 HRC at the following address: <http://www.osg-sossner.com/catalogtap.asp?ProdListNum=14050&ProdNumPos=1> (scroll to bottom of web page). Withdrawal of the rejection is respectfully requested.

Claim Rejections - 35 USC § 102

Claims 1-8 and 24-26 stand rejected under 35 U.S.C. 102(b) as being anticipated by *Hermanson*. In the rejection, the Examiner stated:

Hermanson discloses a sucker rod coupling comprising a hollow cylindrical coupling (12) having internal threads and an outer wear layer; The wear layer comprises a hardness of greater than 40 HRC (column 3, line 45-48), a thickness of at least 0.010 inches (column 3, line 33), a surface finish of 63Ra (column 3, line 52) and is a 76-M-50-S spray metal (column 3, line 36). The hardness of the coupling is greater than 23 HRC which is inclusive of the claimed range. The specific spray would inherently be within the claimed mesh range and the steel is a low carbon, alloy steel. The threads being fully cold formed by rolling, the wear layer being sprayed on and the tempering to provide the hardness are product-by-process limitations wherein only the final product is considered for patentability. See *In re Mrosi*, 21 8 USPQ 289 (Fed. Cir. 1983).

Applicants respectfully traverse the rejection. In Applicants' Remarks made in the Response to Office Action dated November 10, 2003, Applicant stated:

"The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garner*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding 'interbonded by interfusion' to limit structure of the claimed composite and noting that terms such as 'welded,' 'intermixed,' 'ground in place,' 'press fitted,' and 'etched' are capable of construction as structural limitations.)" (See MPEP, § 2113.)

Hermanson does not disclose a coupling, comprising "a hollow, cylindrical coupling blank fabricated of hardenable metal ... and fully cold formed threads on an inner surface of said coupling blank" as recited in claim 1. Hermanson does mention fully cold formed threads on a coupling, but not when the blank is fabricated of hardenable material. In the case of a hardenable blank, Hermanson discloses partially cutting the threads with an existing tap before cold working. This yields a coupling with inferior fatigue properties, i.e., reduced compressive residual stresses at the threads. (See Application, paras. [0009], [0014], and [0020].) The superior fatigue properties of the product (the coupling) are distinctive structural characteristics imparted by the phrase "fully cold formed threads" as recited in claim 1. Similarly, the phrase "hardenable metal", as recited in claim 1, also imparts a distinctive structural characteristic."

In addition to these arguments, *Rallis*, even though not teaching a coupling with fully cold formed threads, still recognizes the advantages of having a coupling with fully cold formed threads as follows:

"In order to increase the strength, and in particular, the fatigue resistance in the threaded portion of these couplings, the threads are roll-formed ... to induce compressive stresses in the thread roots, thus increasing the fatigue life of the coupling." (col. 1, lines 37-41.)

Rallis continues to discuss the fact that *Hermanson's* method of partially cold forming threads results in a coupling with inferior fatigue properties

"The coupling threads are partially completed by machine cutting and subsequently finished by roll-threading. The partial roll-threading induces very *shallow compression stresses*, about 0.003 inch deep, into the thread root." (col. 2, lines 26-30 (emphasis added).)

Further, the favorable residual compressive stresses resulting from cold forming the threads have been recognized in the art as a distinctive structural characteristic as follows:

"Favorable residual compressive stresses may also be introduced by *mechanical* as well as metallurgical means. For example, cold-rolling fatigue-sensitive areas such as thread roots in threaded fasteners, causes the material to plastically deform and spread laterally in the thread root area; however, such motion is constrained by the bulk elastic substrate, resulting in the development of compressive residual stresses at the notch root. The combination of this favorable residual stress pattern with the reduction in stress concentration brought about by the cold-rolling-induced enlargement of the thread root radius and the development of a favorable grain flow pattern ... leads to an improved fatigue life in cold-rolled fasteners." (Richard W. Hertzberg, *Deformation and Fracture Mechanics of Engineering Materials* 578 (1996) (emphasis in original).)

Therefore, claim 1 is patentable over *Hermanson*. Claims 2-7 and 24-26 are also patentable over *Hermanson* since they depend from claim 1.


Claim Rejections - 35 USC § 103

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Hermanson* as applied to claim 1 above, and further in view of *Rallis*. Applicants respectfully traverse the rejection. As discussed above, *Hermanson* does not teach, suggest, or disclose a coupling, comprising "a hollow, cylindrical coupling blank fabricated of hardenable metal ... and fully cold formed threads on an inner surface of said coupling blank" as recited in claim 1. *Rallis* does not teach, suggest, or disclose a

coupling, comprising "a hollow, cylindrical coupling blank fabricated of hardenable metal ... and fully cold formed threads on an inner surface of said coupling blank" as recited in claim 1. *Hermanson* and *Rallis*, alone or in combination, do not teach or disclose all the limitations recited in claim 1. Therefore, claim 1 is patentable over *Hermanson* in view of *Rallis*. Claims 9 is patentable over *Hermanson* in view of *Rallis* since it depends from claim 1.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed. Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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